

## Report of the Workgroup on Epidemiology and Surveillance

### Background and Progress Since Coolfont

. Since the first cases of AIDS were identified in 1981, and the HIV was recognized in 1984 as the etiologic agent, great strides have been made in understanding the epidemiology of HIV infection and the diseases that result from it. In the 2 years following the 1986 Coolfont Report (1) a number of important accomplishments have been achieved, and new issues and goals have been identified. In this report, we describe seven substantive issues, as well as selected cross-cutting issues, that require further Federal action.

By late September 1988, 74,447 cases of AIDS had been reported in the United States, and 41,925 persons were known to have died. The number of cases expected to be reported in 1988 will be nearly 40,000.

In order to obtain more reliable estimates of HIV morbidity and mortality, in September 1987 the surveillance definition of AIDS was broadened (2). The new definition includes--in persons with laboratory evidence of HIV infection--HIV encephalopathy, HIV wasting syndrome, and a broader range of specific AIDS-indicative diseases such as cytomegalovirus (CMV) retinitis and extrapulmonary tuberculosis. It also includes HIV-infected persons with indicator diseases such as *Pneumocystis carinii* pneumonia (PCP) and Kaposi's sarcoma that are diagnosed presumptively--that is, without confirmatory laboratory evidence. The new case definition reflects more accurately not only the serious morbidity associated with HIV infections, but also changes in diagnostic practices--i.e., an increase in presumptive diagnoses.

Epidemiologic studies have provided new information about the natural history of HIV infection, from exposure to infection to disease. In particular, it has become apparent that many seropositive persons will ultimately develop AIDS. (Rates of AIDS incidence have reached as high as 50 percent among seroconvertors followed for 9 years.) Various factors besides behavior that influence the risk of developing AIDS and the progression of the disease (e.g., age and some possible host factors) have been recognized, but need further study.

Several predictors of AIDS have emerged, including number of CD4-positive lymphocytes and

detectable HIV-1 antigen. Some routes of transmission have been found to be more efficient than others, while various factors that may influence transmission, including antigenemia, the host's immune status, and coincidental sexually transmitted diseases, have been suggested. Mathematicians and statisticians have developed approaches to project the future course of the epidemic. Finally, the magnitude of the HIV epidemic has come into clearer focus through the collation of seroprevalence data from large population surveys. All of these findings reinforce an appreciation of the ominous magnitude of the HIV and AIDS epidemic now and as projected for the future.

In 1986 the Public Health Service estimated that, by the end of 1991, about 270,000 cumulative AIDS cases would have been diagnosed (1). Of these cases, it was projected that 15,800 would be diagnosed in 1986 and 23,000 in 1987. The actual number of cases now expected for these years, after adjusting for reporting delays, is 17,100 for 1986 and 25,200 for 1987. These totals slightly exceed the earlier projections, in part because the recent changes in the AIDS surveillance definition have allowed the reporting of cases not included originally.

Using the same extrapolation method as before, PHS now projects that, by the end of 1992, the cumulative number of diagnosed AIDS cases meeting the current definition will total 365,000, with 263,000 cumulative deaths. (For a discussion of methods for and problems of projecting AIDS cases, see the appendix at the end of this chapter.) In 1992 alone, 80,000 new cases will be diagnosed, and 65,000 persons--primarily those diagnosed in previous years--will die from the disease. In 1992 a total of 172,000 AIDS patients will require medical care, at a cost expected to range from \$5 billion to \$13 billion. These figures still underestimate the true magnitude of HIV morbidity, since many clinical manifestations are not reportable even under the current AIDS surveillance definition.

The recent changes in the AIDS case definition make extrapolation more difficult. The ranges for the current projections are quite wide--wider than those of prior projections--reflecting lack of certainty, particularly beyond 1989. The range for the cumulative number of cases diagnosed by the end of 1992 is 205,000 to 440,000, and the range for the number of deaths is 180,000 to 300,000.

Changes in the case definition have also had a significant effect on the distribution of reported cases. Of the cases meeting the pre-1987 case definition and diagnosed in the 12-month interval from July 1986 through June 1987, 67 percent

were reported among homosexual and bisexual men without a history of IV drug abuse and 23 percent were reported among drug abusers. (It should be noted that there is some overlap between the two groups.) In contrast, of the cases diagnosed from September 1987 through March 1988 and meeting only the new surveillance criteria--in other words, persons who would have previously been excluded or reported later--43 percent were homosexual and bisexual men who were not drug abusers, and 43 percent were homosexual or heterosexual drug abusers.

The proportion of cases associated with heterosexual transmission (excluding persons born outside the United States) from others at risk increased from 2.6 percent of cases diagnosed in the July 1986 - June 1987 interval to 3.6 percent of cases diagnosed since then; the proportion of cases diagnosed among blacks increased from 24 percent to 36 percent, while the proportion among Hispanics increased from 13 percent to 16 percent.

The dramatic changes in these proportions demonstrate the impact that the revised case definition has had. However, it is difficult to project trends by transmission category until it can be determined whether the recent changes are one-time adjustments for previous underreporting or represent significant trends.

In 1986, PHS estimated that between 1 million and 1.5 million people in the United States were then infected with HIV (1). Data available in 1988 suggest that the 1986 estimate was too high; a more accurate estimate for 1986 might have been fewer than 1 million (2). Recent reviews of estimates suggest that 1 million to 1.5 million is a reasonable range for the number of persons now infected with HIV (3). This estimate is consistent with the projections for the incidence of AIDS through 1992, based on what is known about the rate at which those infected with HIV progress to AIDS.

Despite current uncertainty about the incidence of new infection and the ultimate magnitude of the problem, HIV-related disease remains a growing threat to the public health of the Nation and will continue to have a significant impact on health care and social services delivery systems. Additional epidemiologic and surveillance studies are being designed and conducted to collect information about the spread of infection through the population. Methods being developed will make it possible to use this information to forecast HIV-associated morbidity and mortality more accurately.

Significant data and information needs and issues must be addressed by PHS in a coordinated and encompassing plan. Our current knowledge has led us to appreciate the complexity of the factors that contribute to risk of infection. Epidemiologic studies need to be expanded to increase our understanding of the factors that influence risk. We need to learn more about who is becoming infected, and how and why. This means developing data bases that are representative as well as informative about the numbers of persons engaged in behaviors that contribute to risk.

As therapies are implemented more widely, additional surveillance mechanisms monitoring changes in morbidity and mortality will be needed to document the therapies' impact, if any, on the course of the epidemic. Surveillance networks are already stressed by the burgeoning caseload and are, in many cases, understaffed. If the quality of the information base is threatened, the ability to model the future course of the epidemic will be jeopardized as well. Support for development of basic research in modeling is also needed.

Factors relating to the excess of HIV infection in black and Hispanic populations need to be elucidated. More information is urgently needed on heterosexual transmission, mother-to-infant transmission, and pediatric AIDS. The serious implications of the AIDS epidemic for countries in the developing world underscore the importance of PHS efforts, coordinated with those of international agencies--particularly the World Health Organization (WHO)--to investigate the circumstances of HIV and AIDS in these countries. International studies have also led to the recognition of HIV-2 in Western Africa. Because of the risk that HIV-2 might be introduced into this country, HIV-2 infection needs to be monitored and evaluated as a potential threat to U.S. public health.

PHS has made great progress in understanding the extent of the HIV epidemic, and continues to expand its efforts to meet this urgent need. This expansion will need to focus on certain critical areas to ensure that our Nation's response to AIDS will continue to progress.

### **Issues, Goals, and Objectives**

**Issue:** Accuracy of AIDS Case Surveillance Data

**Goal:** Maintain national surveillance of AIDS cases by continuing to promote confidential, complete, and timely reporting, and by providing technical

assistance on surveillance activities at the State and local levels.

**Objectives:**

- Ensure that sufficient support is available from the Centers for Disease Control (CDC) to enable State and other case report sources to maintain reporting levels.
- Ensure that sufficient support is available from CDC to perform needed consultations with State and local health department and laboratory staff.

**Goal:** Evaluate the AIDS surveillance system in an ongoing manner to determine completeness and timeliness of reporting, the impact of the revised surveillance definition, the effectiveness of pediatric surveillance, and the utility of the system in answering key epidemiologic, surveillance, and behavioral questions.

**Objectives:**

- Help State and local health departments assemble sufficient resources to ensure completeness and timeliness in reporting AIDS surveillance data and to conduct an ongoing standardized evaluation of the system, including use of multilingual surveillance instruments in ethnically diverse areas.
- Through a coordinated approach with the public and private health communities, develop a plan to remove any obstacles--including lack of confidentiality protections--that impede ready access to and utilization of HIV antibody-testing results to determine whether patients meet the revised AIDS definition.
- Convene a panel of pediatric health-care consultants from various disciplines to review the usefulness of the pediatric AIDS case definition and the classification system for identifying serious HIV-related illness in children under 13 (4), and explore the feasibility and practicality of working through State and local health departments to establish a national pediatric HIV reporting system.
- Conduct standardized validation studies, in areas with both high and moderate AIDS incidence, to obtain comparable data on the delay between the time AIDS is diagnosed and the time it is reported to the health department, as well as data on the completeness of reporting of AIDS cases meeting the surveillance definition.

- Conduct studies directed toward racial/ethnic subgroups, using multilingual instruments where appropriate, to determine the completeness of reporting for cases meeting the revised AIDS surveillance definition.
- In conjunction with ongoing active surveillance programs, conduct supplemental studies, especially within certain groups (women, minorities, persons 20 to 49 years of age, etc.), to evaluate increased morbidity and mortality, not identified by current surveillance procedures, that may be masked by variations in diagnostic practices.
- Conduct multicenter studies to determine how reliably the revised AIDS surveillance definition is being applied and to what extent the increased burden of reporting has increased delays in reporting cases to the CDC.
- Explore using routine hospital and outpatient record systems, including Medicare and Medicaid records, as alternative sources of data on severe HIV-associated morbidity, and investigate the abilities and limitations of these data sets for answering questions not answerable with existing surveillance data.
- Conduct studies to determine what proportion of the patients reported with opportunistic diseases or conditions that meet only the 1987 revised case definition will eventually develop conditions countable under the prior case definition.
- For answering key epidemiologic, surveillance, and behavioral questions, explore expanded uses of the national AIDS case surveillance system, including supplemental funding and personnel for health departments participating in expanded data collection initiatives.

**Issue:** Current Incidence and Prevalence of HIV Infection

**Goal:** Determine the prevalence and monitor trends of HIV infection by age, race/ethnicity, sex, and geographic area for individuals in known transmission categories and in the general population.

**Objectives:**

- Expand those serologic surveys currently used to estimate the prevalence and incidence of HIV infection in a variety of geographic areas and populations into a nationwide initiative, using multilingual questionnaires where appropriate.

- To ensure consistency of survey results, maintain support for the development, use, and evaluation of diagnostic procedures and tests for HIV infection.
- Use the National Health Interview Survey to determine which segments of the U.S. population are included in the serologic surveys. Additional prevalence surveys should be developed to identify and include important segments of the population that may be missed.
- Design and implement serologic surveys to directly evaluate modes of transmission and estimate the proportion of seroprevalence attributable to various risk behaviors. Where serologic surveys do not evaluate modes of transmission, separate studies should be used to determine the distribution of risk behaviors in the survey populations.
- Use data from nationally conducted studies evaluating the timeliness, accuracy, and completeness of AIDS case reporting to assist in making estimates of the current level of HIV infection.
- Expand current research aimed at better understanding why blacks and Hispanics have been disproportionately affected by AIDS and HIV infection. Such research may help provide improved estimates of the magnitude of the HIV problem in these populations.
- Implement collection mechanisms to provide consistent data over periods covering many years. Multilingual questionnaires are needed to improve accuracy of data collected in ethnic populations in which English is not the primary language.
- Work with State health departments to evaluate the effectiveness of State-required HIV reporting in counseling and testing and other HIV prevention efforts.

**Issue:** Characteristics and Distribution of Behaviors Associated with Risks of HIV Infection

**Goal:** Develop improved data on the characteristics and distribution of intravenous drug abuse and sexual behaviors in the United States.

**Objectives:**

- Review and summarize existing data on sexual behavior and IV drug abuse, as well as the methodologies used for collecting such informa-

tion, that might be relevant for the study of the HIV epidemic.

- Fund specific studies to evaluate current surveys of IV drug abuse and sexual behavior to determine whether the data being collected are applicable for determining the spread of HIV infection, and make recommendations.
- Provide financial support to develop better methods to study sexual behavior and the extent of IV drug abuse.
- Continue and expand support for national and local population-based studies of IV drug abuse and sexual behavior.
- Design specific surveys to elicit information on IV drug abuse and sexual behavior from adolescents and racial/ethnic minorities, using multilingual questionnaires where appropriate.

**Issue:** Rates and Determinants of HIV Transmission

**Goal:** Determine factors and quantitative risks for HIV transmission through various modes, including type of sexual contact, IV drug use, mother-to-newborn transmission, occupational exposure to blood, and receipt of infected blood or blood products.

**Objectives:**

- Design and implement additional studies to improve the monitoring of heterosexual spread of HIV infection.
- Design and implement studies to determine how well different protective measures, such as the use of condoms during sexual intercourse, reduce the risk of HIV transmission.
- Develop and implement studies to determine whether inoculum size, host factors, concomitant medical conditions, and external factors such as IV drug abuse affect the likelihood of transmission and infection.
- Develop studies to determine whether certain strains of HIV are more infective than others.
- Design and implement additional studies to evaluate how virologic and immunologic parameters and the effects of cofactors and therapies are associated with risk of infection, progression from infection to development of clinical illness, and death.

**Issue:** Natural History of HIV Infection

**Goal:** Expand our knowledge of the course of HIV infection in infants and children as well as adults, with special attention to factors that influence the rate at which illness develops and the type of illness that develops.

**Objectives:**

- Develop a plan to coordinate and share natural history data from studies under way, and provide these data in an easily accessible format for use by a variety of scientists.
- Expand current natural history studies by including components to determine whether certain cofactors influence the rate at which illness develops and the type of illness that develops.
- Develop and evaluate diagnostic tests for detecting infection early.
- Apply the best early detection test to various exposed populations.
- Develop better methods to document precise time of exposure.
- Continue and expand current natural history studies to describe the progression of disease, from HIV infection to AIDS in various populations, including infants and children.
- Expand current natural history studies to determine whether racial, ethnic, or genetic factors affect HIV infection rates and outcomes.
- Support studies to determine the influence of HIV viral characteristics and host factors on the rate at which illness develops and the type of illness that develops.
- Design and support studies to determine whether reinfection with HIV influences the rate at which illness develops and the type of illness that develops.
- Design and implement studies to determine the impact of therapy on the progression of HIV infection and AIDS.
- Encourage the standardization of disease definitions and study methods so that data obtained using various methodologies can be compared.

**Issue:** Epidemiologic Information on HIV Infection from Studies Conducted Abroad

**Goal:** Facilitate international collaboration on AIDS in the field of epidemiology.

**Goal:** Expand understanding of HIV infection by increasing knowledge of factors related to the epidemiology, natural history, transmission, and surveillance of HIV infection outside the United States.

**Objectives:**

- Through collaboration with WHO and other international agencies, as well as bilateral agreements with other countries, encourage and provide financial support for studies to determine the role of various host factors, virologic factors, behaviors, existing conditions, etc., in the epidemiology of HIV-1 infection outside the United States.
- Expand support for international studies to determine the factors influencing incidence and prevalence of HIV-1 infection outside the United States.
- Expand support for studies to determine the modes, rates, and factors influencing HIV-2 transmission in populations where this virus is found.
- Expand support for international studies to determine the rate of progression to disease in persons infected with HIV-2.
- Continue support for studies to develop and evaluate the sensitivity and specificity of tests for HIV-2 infection.

**Issue:** Effective Use of Mathematical and Statistical Modeling

**Goal:** Develop more effective models so as to better understand and evaluate the HIV epidemic and the effectiveness of intervention strategies.

**Objectives:**

- Develop procedures to improve the accuracy of AIDS case predictions.
- Refine models to improve the precision of estimates of HIV prevalence in the United States.
- Provide support for the development of models to evaluate the effectiveness of education and intervention programs designed to improve knowledge, change behavior, and ultimately lower the incidence of HIV infection in various populations.

- Expand and improve current models to better elucidate the effects of behavior modification on the transmission of HIV within and among populations at risk.
- Through various mechanisms, including conferences, funding initiatives, etc., promote more collaboration among modelers, epidemiologists, and behavioral and laboratory scientists to encourage the development of models that are more accurate; preserving confidentiality of data remains an important focus for such collaborative efforts.
- Provide financial and technical support for studies to improve understanding of the uncertainties associated with predictions.
- Develop methods for understanding how uncertainties in the parameters driving mathematical models influence projections.
- On a regular basis, review and update case projections by incorporating recent surveillance and other available data.
- To reconcile overall predictions with subgroup predictions, provide support for studies to improve methods that project and aggregate AIDS cases in various subpopulations such as racial/ethnic populations and risk behavior groups.

**Issue:** Distribution and Rate of Transmission of HIV Infection and AIDS in Racial and Ethnic Minorities

The prevalence of HIV disease in blacks and Hispanics is twice as great as their proportion in the general population. While all primary modes of transmission are found in these populations, IV drug abusers and their sexual partners and their newborns are overrepresented. The rates of HIV infection and AIDS in Asians/Pacific Islanders and [Native] American Indians/Alaskan Natives are reportedly low, but may be underestimated.

**Goal:** Develop information on the prevalence, incidence, and rate of transmission of HIV in different minority populations.

**Objectives:**

- Collect survey and HIV seroprevalence data (using multilingual questionnaires when appropriate) in expanded samples of blacks and high-risk ethnic groups.

- Develop and evaluate effective data collection methods for obtaining information on HIV infections in various racial and ethnic populations, including blacks, Hispanics, Asians/Pacific Islanders, and American Indians/Alaskan Natives.
- Hire additional minority epidemiologists and surveillance personnel.

**Issue:** Role of Epidemiology and Surveillance Data in Planning Resource Allocation

**Goal:** Ensure the availability of good data on the number and characteristics of individuals at all stages of HIV infection, and use these data to project estimates of the future costs of medical and social services for people with HIV-related illnesses.

**Objectives:**

- Initiate additional studies to determine HIV-associated mortality rates for patients diagnosed with specific diseases and conditions, and determine the effects of therapies such as AZT on those rates.
- Conduct studies to forecast health care costs accurately not only for patients meeting the national surveillance definition for AIDS, but also for persons with other clinical illness due to HIV infection. This will require estimates of the number of persons with all clinical illnesses related to HIV infection.
- Develop and implement further research to determine the value of stratifying projections based on various patient factors such as risk group, geographic area, age, sex, race, and ethnicity.

**Issue:** Effective Methodologies for Studying Various Aspects of the HIV Epidemic

Improved research methodologies will serve many purposes, including use in the design and interpretation of epidemiologic studies, projection of the future course of the epidemic, and comparisons of and predictions about the potential efficacy of interventions aimed at changing sexual behavior and preventing transmission of HIV.

**Goal:** Expand and improve methodologies needed to study various aspects of the HIV epidemic.

**Objectives:**

- Develop survey methods for reliable collection of highly sensitive data concerning sexual practices and illicit drug use.

- Develop statistical methods to better study and adjust for underreporting and delayed reporting of events.
- Develop improved biostatistical methods and mathematical models that better utilize data on the natural history and spread of HIV infection.

**Issue:** Impact of Confidentiality

The extent to which concerns about confidentiality and discrimination affect epidemiologic and surveillance data is not well known but may be considerable.

**Goal:** Recognize and address the potential impact of confidentiality and discrimination in all collection, storage, and use of data.

**References**.....

1. Coolfont report: A PHS plan for prevention and control of AIDS and the AIDS virus. Public Health Rep 101: 341-348, July-August 1986.
2. Centers for Disease Control: Revision of the CDC surveillance case definition for acquired immunodeficiency syndrome. MMWR 36 (supp. No. 1):1-15, Aug. 14, 1987.
3. Centers for Disease Control: Human immunodeficiency virus infection in the United States: a review of current knowledge. MMWR 36 (supp. No. S-6): 1-48, Dec. 18, 1987.
4. Centers for Disease Control: Classification system for human immunodeficiency virus (HIV) infection in children under 13 years of age. MMWR 36:225-236, Apr. 24, 1987.

**Appendix/Workgroup on Epidemiology and Surveillance**

**AIDS Case Projections**

A number of caveats need to be considered in making projections of AIDS cases. A degree of uncertainty is always associated with statistical data, and so health policies are often necessarily formulated with less than perfect data and with data that are stated with confidence limits. Data users need to be aware of these uncertainties. In addition, different levels of data precision are needed for different uses of the data.

Projections of AIDS cases for 2 to 3 years in the future are expected to be reasonably accurate. Long-term forecasts of AIDS incidence, approaching 5 years and beyond, are less accurate. Long-term projections depend upon ability to forecast the future spread of HIV infection in the population, which in turn depends on many unknown factors; shorter-term projections rely primarily on the progression to disease among those already infected.

Two methods have been used for making projections about AIDS incidence. Both require good historical data on AIDS incidence. The first method, called the extrapolation approach, statistically fits an empirical model to past trends and projects those trends into the future (1). This approach is reasonable because the incubation time is long and variable; this incubation time distribution will smooth trends in AIDS incidence even though the underlying trends in HIV infection may be changing more rapidly or differently.

The second approach, called back-calculation, estimates the historical trends in HIV infection from AIDS incidence data and from knowledge of the incubation time distribution by assuming that those infected continue to develop AIDS according to that distribution (2,3). Although the method as originally proposed does not account for new infections (i.e., within 2 to 3 years), it will give reasonable near-term projections (2 to 3 years) because of the long incubation time. Additional adjustments can also be made to allow for new infections.

These methods were applied to the 58,070 AIDS cases diagnosed before July 1987 and reported through March 1988. Case totals were adjusted for reporting delays under the assumption that the delay distribution has remained stationary over time. (There is preliminary evidence that reporting

delays are increasing, but this cannot yet be quantitatively assessed.)

The projections from each method are based on subsets of all cases diagnosed during July 1983 through June 1987 and reported to CDC by March 31, 1988.

Reported quarterly incidence was adjusted for reporting delays before projections were made. The projections from the back-calculation method were based on cases meeting the pre-1987 case definition (4). The projections from the extrapolation method also included cases reported on the basis of presumptive diagnoses under the new case definition. These presumptive diagnoses are for diseases that required a definitive diagnosis under the old case definition. Data suggest that these diagnoses represent a shift from definitive diagnoses (for diseases such as *Pneumocystis carinii* pneumonia), rather than additional cases; such a shift in diagnostic practice was one reason for changing the case definition.

To account for other cases reportable under the new surveillance definition, adjustment factors were calculated from patients diagnosed and reported between September 1, 1987, and March 31, 1988. Of these 8,360 cases, 896 (10.7 percent) were diagnosed presumptively and 1,122 (13.4 percent) had definitively diagnosed conditions that fit only the revised definition. In adjusting the back-calculation figures, we have assumed that all of the presumptively diagnosed AIDS cases would have been reported under the old case definition. For both sets of projections, we have assumed that roughly half those persons diagnosed with wasting syndrome, dementia, or other conditions added to the definition would eventually develop conditions counted under the prior definition. This gives an adjustment of 24 percent to be added to the back-calculation projections, which are based solely on cases diagnosed under the old criteria, and of 9 percent for the extrapolation projections, which included presumptive cases. In addition, for purposes of health-care planning, it is necessary to inflate both sets of projections by an additional factor of 10 percent to account for AIDS cases that are never reported (5). This 10-percent factor is *not* included in the table, which shows the projected number of cases that will be reported to CDC.

Each of the methods used for projecting has certain limitations. The extrapolation model is purely empirical and assumes that trends in diagnosis and reporting remain unchanged. The model does not depend upon or use quantitative knowledge about the natural history of HIV infection. The

reliability of this method depends on the choice of an appropriate functional form for the model. Despite these limitations, in 1986 this procedure worked well in making projections for AIDS cases 1 to 2 years ahead (i.e., the short term).

The back-calculation method requires accurate information on the incubation time distribution. Such estimates are available from studies of homosexual men, persons with hemophilia, and transfusion-associated AIDS cases, though the number of persons in these studies is small and current estimates of the incubation time are not precise. Additional followup of these cohorts is needed to estimate more precisely the shape of the distribution. Additional adjustments to account for new infections are required. While these adjustments have a relatively small effect on near-term projections, they become increasingly important over time. The method of back calculation could be improved to permit long-term projections if estimates of the number currently infected were more reliable.

For medical care costs, a range of \$30,000 to \$75,000 per person alive during 1992 was used. This range is derived from the work of Anne Scitovsky and colleagues (6). Although changes in the treatment of persons with AIDS, such as greater use of nonhospital services and introduction of new therapies (most notably AZT) are having an impact on medical care costs, until more definitive studies are done, the Scitovsky ranges appear to be the most reasonable to use.

## References.....

1. Morgan, W. M., and Curran, J. W.: Acquired immunodeficiency syndrome: current and future trends. *Public Health Rep* 101: 459-465, September-October 1986.
2. Brookmeyer, R., and Gail, M. H.: Minimum size of acquired immunodeficiency syndrome (AIDS) epidemic in the United States. *Lancet* 8519: 1320-1322, December 6, 1986.
3. Brookmeyer, R., and Gail, M. H.: A methodology for obtaining short-term projections and lower bounds on the size of the AIDS epidemic. *J Amer Stat Assn.* 83: 301-308, June 1988.
4. Centers for Disease Control: Revision of the CDC surveillance case definition for acquired immunodeficiency syndrome. *MMWR* 36 (supp. No. 1): 1-15, Aug. 14, 1987.
5. Hardy, A. M.: Review of death certificates to assess completeness of AIDS case reporting. *Public Health Rep* 102: 386-391, July-August 1987.
6. Scitovsky, A. A., and Rice, D. P.: Estimates of the direct and indirect costs of acquired immunodeficiency syndrome in the United States, 1985, 1986, and 1991: *Public Health Rep* 102: 5-17, January-February 1987.

**ERRATUM: AIDS Case Projections** The last sentence in the third full paragraph on page 17 is not correct. It should read: Because this 10-percent factor is included in the table, fewer cases than given in the table are expected to be reported to CDC.

### AIDS cases projected by year<sup>a</sup>, 1988 through 1992

Year	Extrapolation Method		Back-Calculation Estimation Method <sup>c</sup>
	Estimate <sup>b</sup>	68% Prediction Interval	
1988	39,000	32,000-41,000	41,000
1989	49,000	32,000-56,000	52,000
1990	60,000	28,000-73,000	63,000
1991	71,000	21,000-94,000	74,000
1992	80,000	13,000-119,000	84,000
Total <sup>d</sup> through 1992	365,000	205,000-440,000	380,000

a. Projections are based on cases diagnosed July 1983 through June 1987 and reported to the Centers for Disease Control by March 1988.

b. Based on the model  $(Y_t^p - 1)/p = 29.58 + 1.289t - 0.0145t^2$ , where  $p=0.29$ , and the time scale  $t$  is in calendar quarters;  $t=0$  is the second quarter of 1985. Model projections were inflated by 19% to account for patients diagnosed with HIV-related dementia, wasting syndrome, or other diseases not reportable under the pre-1987 definition and for AIDS cases never reported.

c. Assumes a Weibull incubation time  $F(t)=1-\exp(-.004t^{2.438})$  and allows for new infections after June 1987. Model projections were inflated by 34% to account for presumptively diagnosed AIDS cases; for patients with HIV-related dementia, wasting syndrome, or other diseases not reportable under the pre-1987 definition; and for AIDS cases never reported. The time scale  $t$  is in years.

d. Includes 64,000 cases estimated to be diagnosed through 1987. Total reflects rounding of annual estimates.